DETERMINATION THE EFFICIENCY OF SECONDARY SCHOOLS IN THE PARDUBICE REGION

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Abstract: *Efficiency belongs among frequently discussed topics of public policy. This paper deals with the measurement of the efficiency of secondary schools established by the Pardubice region. We used the data envelopment analysis (DEA) to measure efficiency. One input - the expenditure on teacher salaries, and three outputs - % of pupils success in Czech language, math, and English language exams were selected. The results of this analysis show that 12 secondary schools from the 36 examined secondary schools are effective. Conducted DEA model also determines the way how inefficient school reaches efficiency (how to reduce input and increase outputs). Furthermore, the optimal utilization of capacities calculated as quotient of actual number of pupils and optimal number of pupils expresses the fact that the examined grammar schools use their capacities on average at 80 %, and examined vocational secondary schools only at 60 %. This situation is mainly caused by a long-term decline in birth rates when the number of secondary school pupils is decreasing.*

Keywords: *Data Envelopment Analysis, Secondary Schools, Efficiency, Capacity, Pupils Results.*

JEL Classification: *I210, H750.*

Introduction

An educated population is a foundation for the economic and social development of each country. Elementary and secondary schools prepare students for further education and to full social life. Therefore, providing a quality education is one of the most important public services. Public expenditure is crucial to assure the access to quality education for all citizens. However, it is also necessary to spend public resources efficiently from economic point of view.

In recent times, the Czech Republic faces the problem of the lack of pupils of secondary schools in terms of school capacity. There is an excess supply (capacity of schools) over demand (number of pupils). This situation is mainly caused by a long-term decline in birth rates when the number of secondary school pupils is decreasing, but the current inappropriate funding system also plays an important role. All these effects reduce the efficient use of public resources.

This paper is organized as follows: Section 1 presents current issues on the Czech Republic secondary schools and approaches towards the evaluation of efficiency of secondary schools. Section 2 describes data and method used. Section 3 presents our findings, Section 4 discussion. Lastly, a brief conclusion about the research is presented.

1 Statement of a problem

In the context of the Czech Republic, the issue of regional education concerns especially financing. The current system of funding according to the number of pupils does not lead to the optimal structure of secondary schools. This system puts pressure on schools to accept the maximum number of pupils and within the framework of the

legislation, the regional authorities can increase the amount of funds for secondary schools with low capacity utilization in order to maintain their established schools through their regional norms. This strategy of the regional authorities together with the unfavourable demographic development causes excess supply (capacity of schools) over demand (number of pupils) (EDUin, 2018; MEYS CR, 2018a).

In the Czech Republic, there has been a significant decline in birth rates since the 1990s. This development is reflected in primary and secondary education. Secondary schools with very low capacity utilization have been optimized in the past in the whole Czech Republic. Moreover, after 1989 there were many new educational facilities. The creation of new entities has not been regulated and their number has increased significantly. The first efforts of the government to optimize the network of secondary schools occurred in 1995-2000, when several secondary schools were merged. Optimization efforts continued until the year 2003. The largest wave of merging came in 2011, when utilization of capacities of secondary schools was less than 60 %. This wave of merging covered almost all regions (MEYS CR, 2013).

But merging schools has met with disagreement among citizens. Berka (2015) adds that this is a political issue, and politicians are not interested in merging schools because of the outflow of voter's favour. Despite public protests, the Pardubice Region (but also other regions in the Czech Republic) previously managed to merge some of the little-used secondary schools, mainly vocational secondary schools. Recently, the Council of the Hradec Králové Region has approved the merger of 21 secondary schools in the region. The number of schools should be reduced to 10 schools. Most of them are vocational schools (Lechmann, 2017). The merging is also considered in the Vysočina Region, or in Prague Region. Functioning of secondary schools with very low capacity utilization is not effective.

A huge literature about the educational productivity and efficiency exists (Lassibille and Gómez, 2000; Duru-Bellat and Suchaut, 2005; Davutyan, Demir and Polat, 2010). The main issue in school evaluation of efficiency is the definition of the factors that reflect the performance of the school. A current approach to school evaluation considers schools as production units that use multiple inputs (recourses) and produce multiple outputs. A commonly accepted measure is based on the records of students in the national matriculation examinations. School efficiency is often assessed through measuring student achievement.

Due to the unknown nature of the educational production function, there are two main approaches usually applied in school evaluation: the stochastic frontiers methods and data envelopment analysis (DEA). Efficiency of schools is possible to determine by using stochastic production frontier or least squares method (Perelman and Santin, 2011). But these methods have the drawback that they can only deal with single outputs but schools do not produce just one output and the multiplicity of outputs produced by a school cannot be aggregated into a single measure in any meaningful way.

Some studies have relied on traditional regression with students serving as the unit of analysis. A weakness of this approach is that it ignores between-schools variation at the school level (Deutsch et al., 2013). This issue could be addressed with a multilevel regression analysis used Fekjær and Birkelund (2007) which is a multi-stage methodology that could use both schools and students as units of analysis,

acknowledging that students are nested within schools. However, multi-level analysis makes parametric assumptions about the distribution of schools and students on variables studied.

For the evaluation of the efficiency of secondary schools we can also use comparative methods, norms and standards but the most commonly used are modelling methods distinguished by the mathematical-statistical apparatus, namely non-parametric DEA. DEA has many advantages. This method has the ability to process multiple inputs and outputs simultaneously without requiring aggregation, to specify production relationships non-parametrically without limiting a particular functional standard, to analyse potential cost savings and production gains resulting from changes in inputs and outputs. It does not work with financial categories such as profit, it is not necessary to calculate inputs and outputs valued in monetary units. Therefore, this method is suitable for measuring the efficiency of public services. In addition to schools, DEA is often used for public or non-public institutions such as hospitals, agricultural companies, banks, research organizations, or transport organizations (Kohl et. al, 2018; Lee and Worthington, 2016).

The aim of this paper is to evaluate efficiency of secondary schools in the Pardubice region using DEA analysis for the school year of 2016/2017. Then, based on the results, formulate recommendations for improving chosen indicators. The research question is formulated: whether pupils at schools with smaller class size achieve better results in matriculation exams.

2 Methods

This study covers 36 secondary schools established by the Pardubice region. Vocational secondary schools that are part of higher vocational schools were excluded. Also all schools in the sample were divided into vocational and grammar schools for analysis due to different characteristics between these types of schools. Vocational secondary schools have significantly higher costs than grammar schools due to the need for more expensive equipment for practical training, or a higher number of teachers divided into practical and theoretical learning. Due to the nature of the analysis (it expresses the unit's efficiency within the group of units under investigation; DEA compares unit with respect to the best units) non-distribution of these types of schools would then distort the results. The data about schools was obtained from the internal materials of the Statutory City of Pardubice and data on the achievements of pupils was obtained from the website of CERMAT (2018).

DEA was used to estimate efficiency scores of secondary schools. The DEA method is one of the methods of linear programming that considers each school as a decision-making unit (DMU) using inputs to produce outputs with the aim to compute efficiency scores. DEA is used to develop an efficiency frontier for the DMUs which operate with optimal performance patterns. These optimally performing DMUs, which are considered as efficient, lie on the efficiency frontier and have an efficiency score of 1. In a DEA model, efficiency is defined as the relative ability of each DMU in producing outputs, and the term relative means that each organization is compared with any other homogeneous unit (Moreno and Lozano, 2018).

In this method, outputs are by their nature maximization, i.e. that their higher value leads to higher performance of the monitored units. For creating effects production unit consumes inputs, which are by their nature minimization, i.e. that the lower the value of these inputs leads to higher performance of the monitored units (Hudec and Prochádzková, 2013). Inputs and outputs in the DEA analysis must be chosen to have for the functioning of institution the greatest importance. Outputs of the education system typically include some measure of examination success, but also in some specifications include other measures such as pupils subsequent labour market performance. Inputs characteristically include measures of pupil composition such as ability on entry and socio-economic characteristics. In addition, measures of resourcing are often included, such as pupil–teacher ratio, educational expenditure, and the quality of the teaching staff. Tab. 1 provides a review of frequently used inputs and outputs that used previous studies to measure secondary school efficiency.

Tab. 1: Summary of previous studies

Authors	Sample	Inputs	Outputs
Ruggiero and Vitaliano (1999)	New York school districts	Operating expenditures per student	Scores on standardized tests, Dropout rate, Graduation rate
Davutyan, Demir and Polat (2010)	Turkish secondary schools	Students skills at admission to secondary school, Classrooms per student ratio,	Scores on the nationwide university entrance exam, Admission rate to university
Alexander et al. (2010)	New Zealand secondary schools	Number of fulltime equivalent teachers, Number of teacher aides, Administration expenses, Expenditure on learning resources, Depreciation expenses, Expenditure for raising local funds, Property management expenses	Number of students passing bursary with minimum 4C or better grade, Sum of marks of students passing school certificate examination, Number of students leaving school with a certificate
Portela and Camanho (2016)	Portuguese secondary schools	Average scores on entry, Average number of years in school for the parents, % secondary students not subsidized by state	Average scores on exit on national exams, % students entering public higher education % students completing secondary education in 3 years % students not abandoning secondary education
Nauzeer, Jaunky and Ramesh (2018)	Mauritian secondary schools	Number of classrooms in school, Equipment, Number of academic staffs, Number of administrative staffs, Total number of students in school	% pass at school certificate examination

Source: *Author's analysis based on the literature listed in the table*

DEA models can be oriented to inputs or outputs. In the input-oriented model, DMUs minimize inputs while maintaining the same level of outputs. Conversely, in output-oriented models, DMUs are maximizing their level of outputs while keeping inputs constant. Basically, the difference is the ability that a DMU could control input or output quantity (Staňková and Papadaki, 2017). If it can control input, then an input-oriented version is preferable. In this paper, input-oriented model is employed.

Appearance of the efficient frontier depends on the nature of returns to scale. Returns to scale can be constant or variable. In the case of constant returns to scale (CRS), to maintain efficiency, the proportionate increase of inputs must be accompanied by the same proportionate increase of outputs. It should be taken into consideration that the integration of resources is not always the same in the education process. If they would be utilized at the same level, then we should calculate with CRS, accordingly, variable return to scale (VRS) is preferable. The assumption of VRS provides a more realistic expression of economic reality and factual relations, events and activities (Halásková, Halásková and Prokop, 2018).

3 Problem solving

The following input and output criteria were chosen for the DEA analysis: expenditure on teacher salaries as input, % of pupils success in Czech language, math and English language matriculation exams as outputs (see Tab. 3 and 4). In the case of % of pupils success in exams, the average values for the years 2013 - 2017 were used due to more accurate data when potential unexpected fluctuations in the performance of pupils in individual years were eliminated. The most commonly used inputs and outputs to measure school efficiency were selected, which have the greatest importance for the functioning of the school. Taking into consideration the entire sample of researched schools we can describe them as follows. Tab. 2 depicts the minimum, maximum, mean and standard deviation of each researched input and output.

Tab. 2: Statistical characteristics of inputs and outputs of the DEA model

DMUs = 36	Name	Mean	Maximum	Minimum	Standard deviation
For vocational secondary schools	expenditure on teacher salaries (per pupil)	34 755	41 606	29 832	3 094
	% of pupils success in Czech language exam	78.73	98.24	54.17	12.07
	% of pupils success in math exam	60.56	88.89	25.00	17.22
	% of pupils success in English language exam	85.54	98.67	50.00	11.75
For grammar schools	expenditure on teacher salaries (per pupil)	29 776	35 097	26 231	1 752
	% of pupils success in Czech language exam	97.49	99.01	92.56	1.70
	% of pupils success in math exam	94.46	98.67	86.52	3.59
	% of pupils success in English language exam	98.44	99.57	95.47	1.05

Source: own processing

This analysis used input-based measures of efficiency. The choice of the specific DEA model depends on which of the given characteristics can be influenced and which cannot. Due to the fact that the success of pupils in examinations can hardly be directly influenced, the input-oriented model was chosen. The results of the DEA analysis are presented in Tab. 3 and Tab. 4. School with a coefficient of efficiency equal 1 is effective, a coefficient lower than 1 indicates that school is not effective.

Tab. 3: Order of vocational secondary schools according to their VRS efficiency (from the best to the worst)

Vocational secondary school	Expenditure on teacher salaries in CZK (per pupil)	% success in			Efficiency VRS	Optimal utilization of capacities (in %)
		Czech language	Math	English language		
Secondary industrial school, Chrudim	33 797	89.74	84.21	96.47	1.00000	48.18
High school of chemistry, Pardubice	30 916	98.24	77.78	98.67	1.00000	88.00
Secondary school and food services, Pardubice	29 832	68.75	62.45	74.07	1.00000	65.67
Integrated secondary technical school, Moravská Třebová	29 932	80.00	63.54	82.56	1.00000	65.83
Business academy and secondary school of tourism, Choceň	30 136	95.24	82.54	97.43	1.00000	75.76
Integrated secondary technical school, Vysoké Mýto	32 976	76.25	88.89	85.71	1.00000	65.27
Secondary vocational school, Svitavy	32 147	80.00	50.00	90.54	0.93451	41.05
High school of horticulture and technical, Litomyšl	33 476	86.67	79.31	76.32	0.89877	84.85
Secondary automotive school, Holice	33 931	95.45	45.45	92.36	0.88978	70.80
Industrial secondary school, Letohrad	35 029	92.11	50.00	93.29	0.85913	51.45
Secondary technical school and vocational school, Lanškroun	35 259	82.35	73.25	50.00	0.85072	49.33
Secondary automotive school, Ústí nad Orlicí	35 621	78.21	65.79	92.31	0.84405	62.24
Secondary school for commerce, crafts and services, Žamberk	36 327	68.45	52.25	75.63	0.82171	37.59
Secondary technical school, Králíky	36 378	72.54	64.58	73.25	0.82116	48.44
Secondary agricultural school, Chvaletice	36 720	62.24	53.68	79.54	0.81416	52.14
Secondary technical school and vocational school, Polička	36 807	69.57	57.47	77.27	0.81152	40.00
Secondary school of civil engineering, Pardubice	37 512	85.00	60.00	93.57	0.80196	37.59
Secondary apprentice college for the gas industry and plumbing, Pardubice	38 200	54.17	50.00	89.74	0.78614	85.91
Secondary technical school of mechanical engineering, Třemošnice	38 497	60.00	25.00	97.52	0.78429	65.67
Secondary school of applied arts, Ústí nad Orlicí	41 606	79.69	25.00	94.64	0.72340	55.37

Source: own processing

Tab. 4: Order of grammar schools according to their VRS efficiency (from the best to the worst)

Grammar school	Expenditure on teacher salaries in CZK (per pupil)	% success in			Efficiency VRS	Optimal utilization of capacities (in %)
		Czech language	Math	English language		
Hlinsko	28 324	98.36	93.75	98.64	1.00000	58.96
Pardubice, Dašická	29 771	99.01	98.57	99.57	1.00000	72.20
Přelouč	26 231	97.44	86.52	96.53	1.00000	77.00
Polička	29 215	98.63	97.96	99.27	1.00000	88.34
Litomyšl	29 834	98.79	98.67	99.29	1.00000	90.26
Česká Třebová	28 122	96.61	94.75	98.15	1.00000	93.82
Chrudim	30 280	98.87	98.18	98.83	0.97573	66.53
Lanškroun	29 072	94.51	95.45	97.53	0.97550	84.68
Vysoké Mýto	29 646	97.23	96.43	98.76	0.96840	95.28
Žamberk	30 095	98.37	92.00	99.16	0.96560	79.84
Pardubice, Mozartova	30 255	98.74	96.15	98.77	0.96387	93.50
Ústí nad Orlicí	29 993	98.62	93.55	98.52	0.96327	89.52
Sport grammar school, Pardubice	30 576	97.58	93.75	99.21	0.95273	91.67
Holice	30 724	96.75	97.42	98.63	0.94492	81.00
Moravská Třebová	29 174	92.56	89.28	95.47	0.92083	62.78
Jevíčko	35 097	97.83	88.89	98.63	0.80676	48.81

Source: own processing

DEA analysis identified six effective vocational secondary schools and six effective grammar schools. The last column of the table contains optimal utilization of capacities. It was used data from the Ministry of education youth and sports, Czech Republic (2018b) about the administrative capacity of the school to calculate the optimal utilization of capacities. The administrative capacity of the school expresses the optimal (maximal possible) number of pupils of these schools in compliance with all legislative regulations. For evaluation of optimal utilization of capacities, it is desirable that actual capacities are equal or as near as possible to the optimal (determined) number of pupils of a school. The optimal utilization of capacities (OUC) can be calculated as quotient of actual (resp. real) number of pupils (Anp) and optimal number of pupils (Onp) that is the set capacity of a school, according to formula (Vrabková, 2017):

$$OUC = \left(\frac{A_{np}}{O_{np}}\right) * 100 \quad (1)$$

This indicator cannot be used as a parameter for DEA analysis because the funding of secondary schools takes into account the actual number of pupils. However, low capacity of schools is definitely inefficient in terms of insufficient use of technical possibilities. You can see that effective grammar school Hlinsko has one of the worst capacity utilization (58.96 %). On the other hand, the best use of capacities from all the schools studied has grammar school Vysoké Mýto (95.28 %) which is, according to the analysis, inefficient. Tab. 5 shows the target values for all schools, which did not reach 100 % efficiency (schools that are effective did not change inputs and outputs).

Tab. 5: Improvements for the schools

Secondary school	Expenditure on teacher salaries in CZK (per pupil)	% success in		
		Czech language	Math	English language
Secondary vocational school, Svitavy	32 147 to 30 042	80.00 to 88.18	50.00 to 73.74	90.54 to 90.54
High school of horticulture and technical, Litomyšl	33 476 to 30 087	86.67 to 90.98	79.31 to 79.31	76.32 to 93.67
Secondary automotive school, Holice	33 931 to 30 191	95.45 to 95.45	45.45 to 82.21	92.36 to 97.52
Industrial secondary school, Letohrad	35 029 to 30 094	92.11 to 92.11	50.00 to 78.64	93.29 to 94.38
Secondary technical school and vocational school, Lanškroun	35 259 to 29 995	82.35 to 82.99	73.25 to 73.25	50.00 to 86.63
Secondary automotive school, Ústí nad Orlicí	35 621 to 30 066	78.21 to 89.99	65.79 to 76.00	92.31 to 92.31
Secondary school for commerce, crafts and services, Žamberk	36 327 to 29 850	68.45 to 70.82	52.25 to 62.65	75.63 to 75.63
Secondary technical school, Králíky	36 378 to 29 873	72.54 to 72.54	64.58 to 64.58	73.25 to 77.27
Secondary agricultural school, Chvaletice	36 720 to 29 897	62.24 to 76.00	53.68 to 63.15	79.54 to 79.54
Secondary technical school and vocational school, Polička	36 807 to 29 870	69.57 to 72.99	57.47 to 62.86	77.27 to 77.27
Secondary school of civil engineering, Pardubice	37 512 to 30 083	85.00 to 91.28	60.00 to 77.61	93.57 to 93.57
Secondary apprentice college for the gas industry and plumbing, Pardubice	38 200 to 30 031	54.17 to 87.36	50.00 to 72.71	89.74 to 89.74
Secondary technical school of mechanical engineering, Třemošnice	38 497 to 30 193	60.00 to 95.46	25.00 to 82.19	97.52 to 97.52
Secondary school of applied arts, Ústí nad Orlicí	41 606 to 30 098	79.69 to 92.38	25.00 to 78.98	94.64 to 94.64
Grammar school, Chrudim	30 280 to 29 545	98.87 to 98.87	98.18 to 98.18	98.83 to 99.44
Grammar school, Lanškroun	29 072 to 28 360	94.51 to 97.05	95.45 to 95.45	97.53 to 98.39
Grammar school, Vysoké Mýto	29 646 to 28 709	97.23 to 97.73	96.43 to 96.43	98.76 to 98.76
Grammar school, Žamberk	30 095 to 29 060	98.37 to 98.58	92.00 to 97.22	99.16 to 99.16
Grammar school, Pardubice, Mozartova	30 255 to 29 162	98.74 to 98.74	96.15 to 96.50	98.77 to 99.05
Grammar school, Ústí nad Orlicí	29 993 to 28 892	98.62 to 98.62	93.55 to 95.58	98.52 to 98.81
Sport grammar school, Pardubice	30 576 to 29 130	97.58 to 98.60	93.75 to 97.56	99.21 to 99.21
Grammar school, Holice	30 724 to 29 031	96.75 to 98.29	97.42 to 97.42	98.63 to 99.08
Grammar school, Moravská Třebová	29 174 to 26 865	92.56 to 97.16	89.28 to 89.28	95.47 to 97.07
Grammar school, Jevíčko	35 097 to 28 315	97.83 to 98.36	88.89 to 93.72	98.63 to 98.63

Source: own processing

4 Discussion

The results of the DEA analysis found that 12 examined secondary schools are effective. Others are considered ineffective. The level of efficiency in other schools varies between 72.34 % and 100 %. From this range of values it is evident that the relative efficiency of the schools analysed is quite high and similar, meaning that schools are similar in the monitored parameters. This fact is probably due to the dividing the sample of schools into vocational secondary schools and grammar schools. Schools was divided in this way because of the different characteristics of the two types of schools mentioned above. Grammar schools showed significantly better pupils results and also lower expenditure on teacher salaries compared to vocational secondary schools. Higher standard deviation for vocational secondary schools

compared to grammar schools means large differences in pupil results and expenditure on teacher salaries and hence a bit higher differences in efficiency of individual vocational secondary schools. Grammar schools, on the contrary, have very few differences and their efficiency is more similar.

Furthermore, the optimal utilization of capacities at individual schools was investigated. Most schools showed very low capacity utilization. Grammar schools have an average capacity utilization of around 80 %, vocational secondary schools even less, about 60 %. This situation reduces the efficient use of public resources. If the schools make better use of their capacities, school expenditures on facilities per pupil would be lower.

The research question deals with whether a small number of pupils in classes can also have positive impact on their results. OECD (2017) states that often-mentioned benefit of smaller classes is that teachers can dedicate greater attention to individual students. To answer this question, the relationship between class size and the results of pupils in Czech language, math, and English language exams was sought. The correlation analysis was used. Correlation coefficients for the relationship between the class size and the results of pupils in exams are as follows: for Czech language exam is 0.49, in the case of math exam is 0.53, and for English language exam is 0.55. However, these positive correlation coefficients say that the higher the number of pupils in the class, the higher the percentage success rate of the pupils in exams. In this case, the correlation coefficients are about 0.5, which means a higher correlation rate. The dependence of these indicators was verified by regression analysis. The results of this analysis conclude that these indicators explain the model from not too high percentage (about 21 %). The research question can be answered that the relationship between class size and the results of pupils not been confirmed. Relationship between class size/student-teacher ratio and student achievement also has not been proven by studies (Pritchett, 2001; Bazhenov et al., 2015). In this case, we can see low capacity utilization as negative in terms of insufficient use of technical equipment.

Alexander et al. (2010) analysed the efficiency of New Zealand secondary schools by DEA analysis. After they used regression model to explain the efficiency scores in terms of other variables. They found that socioeconomic deprivation is negatively related to efficiency and proved positive effects from both teacher experience and qualification levels. Portela and Camanho (2016) lists the factors that affect the efficiency of secondary schools. These factors include good resources and infrastructure; motivated and stable body of teachers; effective control (in terms of class attendance, or discipline); self-evaluation and rigorous use of student performance data; involvement of students' parents, or leadership well adapted to the school context.

Aristovnik and Obadić (2014) used the DEA technique to a wide range of EU and OECD countries to evaluate the efficiency of secondary education. The results showed that this efficiency fluctuates significantly across most of the countries. Therefore, it suggests that justifying public secondary education spending is strongly recommended. Czech Republic and most EU countries have similar issues in secondary education. Public secondary schools are mainly funded according to the number of pupils and financial resources are allocated centrally in these countries. For this reason, school directors cannot affect the amount of funds received. Because of this method of financing, secondary schools keep number of pupils at the highest level, even if these

pupils do not have the academic requirements. This nuisance can then be reflected in the form of poor outputs.

Conclusion

The aim of this paper was to evaluate efficiency of 36 secondary schools in the Pardubice region. DEA analysis calculated that one third of these schools are effective. The rest of the sample are inefficient schools. Improving the surveyed indicators, i.e. reduction of the expenditure on teacher salaries (input) and increasing the percentage of pupils success in exams (outputs), is difficult under current legislative conditions. Schools have little impact on level of expenditure on teacher salaries. Current method of financing puts pressure on schools to accept the maximum number of pupils regardless of their academic requirements.

Due to the adverse demographic trend and because of the current way of financing, most of the schools examined do not use enough their capacities. The improvement of capacities of secondary schools can be considered in two ways. The first one is rationalization of capacities by merging of schools or by cancellation of schools (but this way is not popular with the public). The other one is rationalization of capacities by administrative reduction of capacities of secondary schools (reduction of number of pupils in a class).

From the next year, method of financing regional education will change in the Czech Republic. The calculation by number of pupils will replace the calculation by the number of hours of direct pedagogical activity. Regional authorities will no longer have the authority increase the amount of funds for secondary schools with low capacity utilization in order to maintain their established schools. Schools will no longer be pressured to accept and maintain the maximum number of pupils. This new funding system has the potential to rationalize and to make more efficient use of public funds. Demographic development shows that in the next ten years we can expect a modest increase in the number of secondary school pupils. Capacity utilization should therefore be improved. However, then there should be a further decline in the number of secondary school pupils (CZSO, 2014). Schools will therefore have to adapt to demographic trend again.

However, it is necessary to perceive obtained results of DEA soberly, especially because of the use of resources as input. Previous research has shown that pupil characteristics, such as gender and innate ability, socio-economic background and family size (Bazhenov et al., 2015) also have a great effect on exam performance. Another limitation of the DEA analysis method may be that it provides only a measure of relative efficiency that is calculated for each school in relation to the other schools in the sample. Therefore, if all schools included in the analysis have unfavourable levels of indicators, "the best ones" will nevertheless be effective. DEA method does not need to specify the optimal value of the indicators. In the context of further research into secondary school evaluation, it is appropriate to focus on establishing this optimal value for indicators and to use, for example, some multi-criteria evaluation model.

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